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 (71) Applicants  
 Paolo Chiesi, Via Palermo  
 30, 43100 Parma, Italy,  
 Gianfranco Citterio,  
 22055 Merate (Como),  
 Italy  
 (72) Inventors  
 Paolo Chiesi,  
 Gianfranco Citterio  
 (74) Agents  
 Barker, Brettell & Duncan

(54) An inhaler for pulverulent medicinal substances

(57) The inhaler for pulverulent medicinal substances combining the function of a dosage feeder comprises a nozzle 1, a chamber 8 for the storage of the medicinal substance which can rotate relatively to the nozzle 1, and a cavity 18, for the collection of successive doses of the

medicinal substance, communicating with the nozzle 1. Dosing means 14, 14', 15 are provided on the bottom 10 of the chamber 8 and co-operate with dispensing means 16, 17 operated by the relative rotation between the chamber 8 and the nozzle 1 to pour individual and successive doses of medicinal substance into the cavity 18, for inhaling through the nozzle 1.

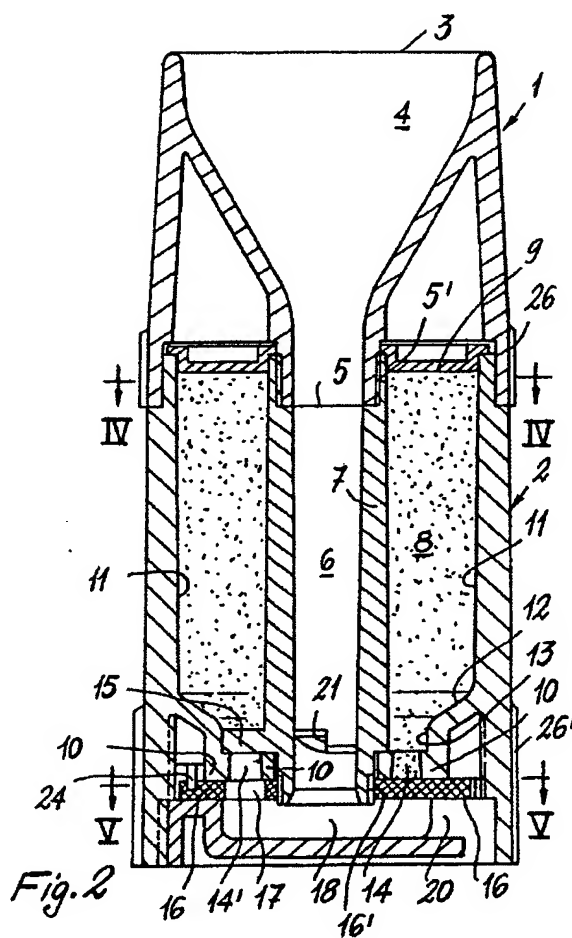


Fig. 2

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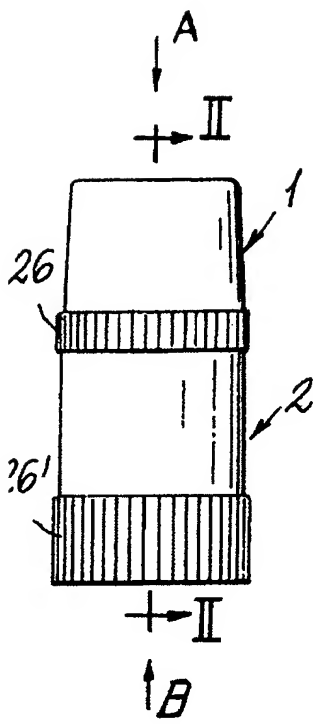


Fig. 1

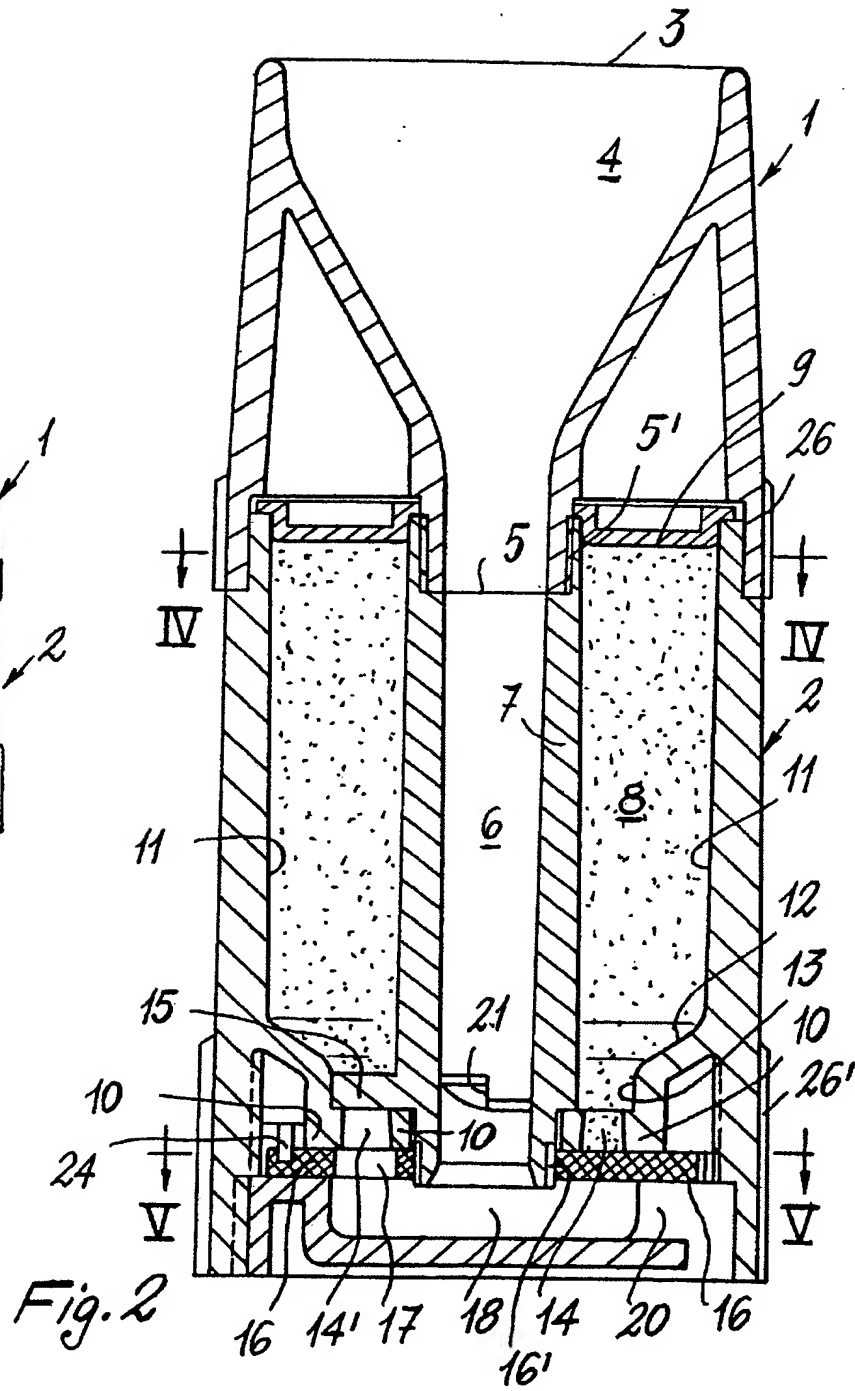
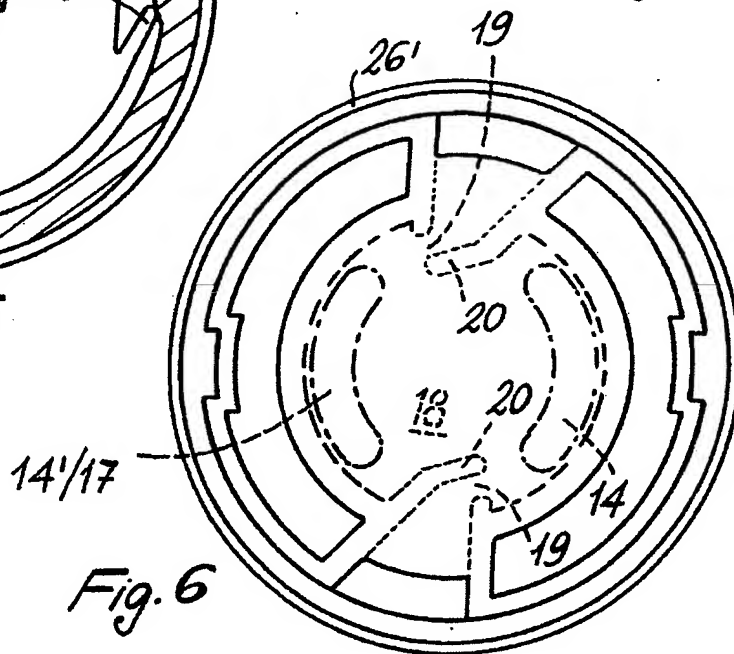
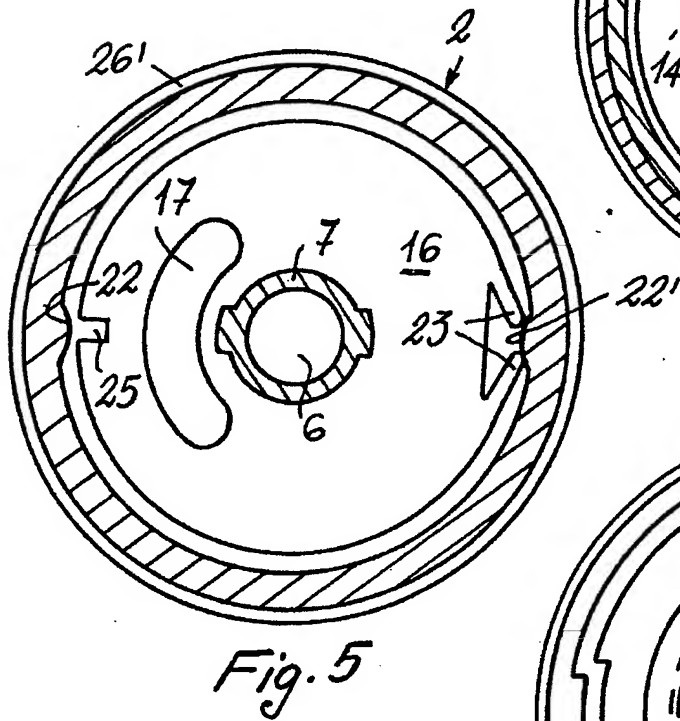
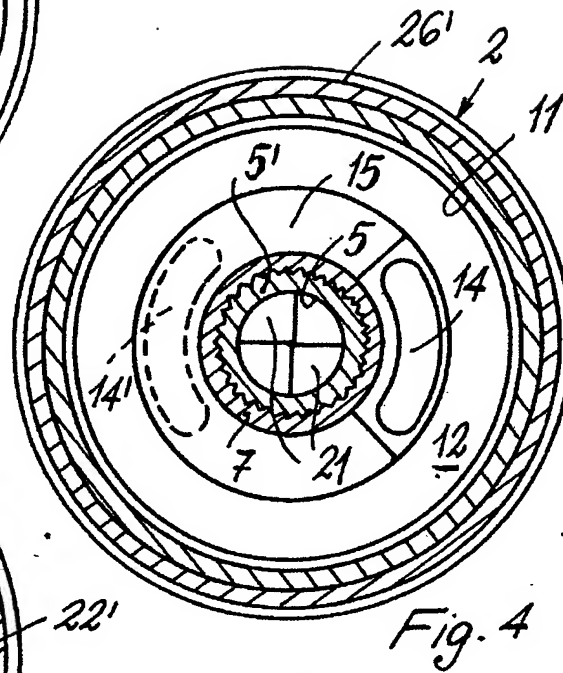
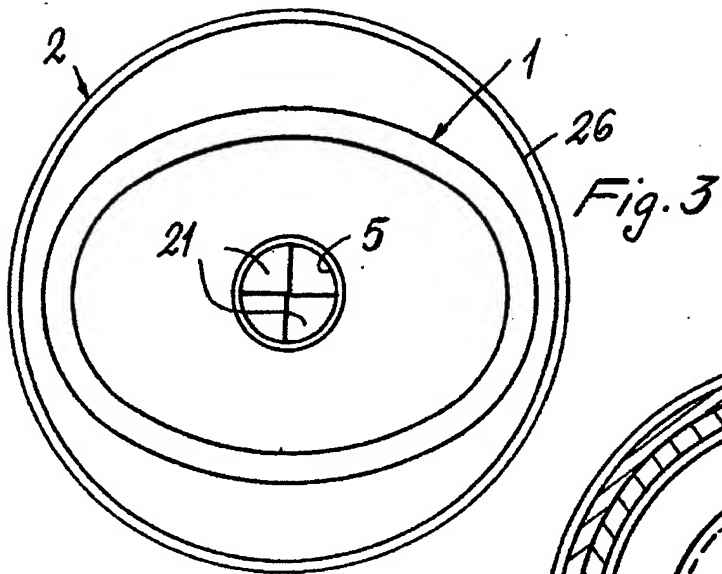


Fig. 2



## SPECIFICATION

## An inhalator for medicinal substances

This invention relates to an inhalator for pulverulent medicinal substances combining the function of a dosage feeder.

The application of medicinal substances in the form of powders by inhalation is quite important in the treatment of pathological forms. To this end, several types of inhalators are already known for inhalation of powders obtained by breakage of capsules and devices for inhalation of pulverulent medicinal substances are known as well.

However, it was found that this second type of apparatus does not provide the desired results due to the particular structure thereof, difficulty in use and not always providing the current dosage.

It is the object of the present invention to provide an inhalator for pulverulent medicinal substances, which avoids the drawbacks found in conventional devices of this type.

This and further objects of the invention will become apparent to those skilled in the art when considering the following description and claims.

According to our invention an inhalator for pulverulent medicinal substances combining the function of a dosage feeder comprises a nozzle, a chamber for storing the said medicinal substance which can rotate relative to said nozzle, a cavity for the collection of successive doses of said medicinal substance communicating with said nozzle, dosing means for said substance provided on the bottom of said chamber, and dispensing means controlled by said relative rotation between said chamber and nozzle to pour into said cavity individual and successive doses of the medicinal substance withdrawn by said dosing means.

A preferred embodiment of the invention is shown only by way of unrestrictive example in the figures of the accompanying drawings, in which:

Figure 1 is a side view of the inhalator as a whole;

Figure 2 is an enlarged sectional view taken along line II—II of Figure 1;

Figure 3 is an enlarged view according to arrow A of Figure 1;

Figure 4 is a sectional view taken along line IV—IV of Figure 2;

Figure 5 is a sectional view taken along line V—V of Figure 2; and

Figure 6 is an enlarged view according to arrow B of Figure 1.

Referring to the above Figures of the accompanying drawings, the inhalator essentially comprises a nozzle generally designated at 1 which is mounted for free rotation on a main body generally designated at 2.

The nozzle 1 has an opening 3 communicating with an inner space 4 which tapers to a circular hole 5 leading, in turn, to a central conduit 6 which slightly tapers in the opposite direction which respect to the hole 5. The conduit 6 comprises a tubular element 7 arranged axially of the body and free to rotate with respect to the

latter. The element 7 is integral with a crown 5' which forms part of the nozzle 1 and defines the hole 5.

The body 2 defines a storage chamber 8 for a pulverulent medicinal substance and

advantageously the volume of such a chamber is such as to store an amount of medicinal substance sufficient for a complete treatment cycle. A closure element 9 defines the top of chamber 8, whereas the lower part thereof is defined by a bottom 10 connecting to the wall 11 of chamber 8 through an inclined surface 12 forming with the bottom 10 an annular vertical surface 13.

Two opposing dosing holes 14 and 14' are formed in the bottom 10, each of which has a volume exactly corresponding to one dose of medicament. At the bottom side the end portion of the tubular element 7 has an integral diaphragm or skirt 15, which is semi-circular and horizontal and bears on the annular surface 13. The skirt is discontinuous for some length substantially corresponding to the length of each of the dosing holes 14, 14' (Figure 4).

The extreme portion of the element 7 has keyed thereto at the bottom of said bottom 10 at 16' a dispensing disc 16 which is provided with a dispensing hole 17 intended for successive registration with the dosing holes 14 and 14', as described in the following.

The lower portion of the body 2 forms a cavity 18 communicating with the exterior of the nozzle by two labyrinth-shaped opposing apertures 19 (Figure 6), such a shape being due to the provision of tortuous walls 20.

Substantially at the level of the skirt 15 and internally of the conduit 6, element 7 is provided with helically extending blades 21. At the level of the dispensing disc 16 internally of the body 2 two opposing projections 22 and 22' are provided and are intended to be successively engaged by two tongues 23 formed on the peripheral edge of the dosing disc 16 opposite to the dispensing hole 17.

Should the inhalator be of a disposal type, means must be made for breaking the seal when the inhalator is first to be used. These means comprises a breakable small pin 24 which is integral with the body 2. Upon first filling and assembling the inhalator the pin 24 engages in a notch formed peripherally in the dosing disc 16, or also equivalent means located between the nozzle 1 and the body 2.

Prior to initial use, as shown in the Figures of the drawings, the chamber 8 is filled with a sufficient amount of medicament for a complete treatment cycle, the skirt 15 closes the dosing and dispensing holes 14° and 17, now in register, the dosing hole 14 is full with a dose of medicament in register with the discontinuous zone of the skirt 15 and is closed at the bottom by the dispensing disc 16, the small integral pin 24 engages the notch 25 to ensure the integrity of the inhalator, and the tongue 23 engage the notch 22'.

In operation, a user causes relative rotation between the nozzle 1 and the body 2 to take place

by gripping the inhalator with one hand at one region 26 of knurling and by the other hand at another level of the knurling 26', so as to rotate the dispensing disc 16 through 180°. This results  
 5 in breakage of the small pin 24 until further rotation is prevented by engagement of the tongues 23 with the notch 22.

During such a rotation, the dispensing hole 17 is moved into register with the dosing hole 14 and  
 10 the dose stored in the latter is pored into the cavity 18, from which it can be inhaled through the conduit 6 and the nozzle 1, owing to the air inflow within the chamber 18 through the labyrinth apertures 19 and also owing to the  
 15 turbulent motion imparted to the medicament by the helical blades 21. During this rotation, said skirt 15 exposes the dosing hole 14', now closed at the bottom by the dispensing disc 16, which will thus be filled up with a new dose in readiness  
 20 for next use.

#### CLAIMS

1. An inhalator for pulverulent medicinal substances combining the function of a dosage feeder, comprising a nozzle, a storage chamber for  
 25 said medicinal substance and rotatable relative to said nozzle, a cavity for the collection of successive doses of said medicinal substance communicating with said nozzle, dosing means formed on the bottom of said chamber, and  
 30 dispensing means controlled by said relative rotation between said chamber and said nozzle to pour into said cavity individual and successive doses of the medicinal substance as withdrawn by said dosing means.

35 2. An inhalator according to Claim 1, in which said dosing means comprise at least one dosing hole formed on the bottom of said storage chamber, and a diaphragm for communication during said relative rotation said chamber with  
 40 said at least one dosing hole.

3. An inhalator according to Claim 2, in which said dispensing means comprise a disc provided with at least one dispensing hole communicating with said cavity for registration during said relative  
 45 rotation with said at least one dosing hole to pour the dose stored therein into said cavity.

4. An inhalator according to Claim 3, in which the nozzle communicates with said cavity through a conduit carrying said diaphragm and said dosing  
 50 disc, said nozzle being integral with said conduit, whereby a relative rotation between said nozzle and said chamber causes a corresponding relative rotation between said conduit and the bottom of said chamber.

55 5. An inhalator according to Claim 4, in which said diaphragm rests with its underside on the upper side of the bottom and the disc rests with its upper side on the underside of said bottom.

6. An inhalator according to Claim 1, in which  
 60 means are provided for indicating the registering position between said dosing and dispensing means.

7. An inhalator according to Claim 1, in which said storage chamber contains an amount of  
 65 medicinal substance corresponding to the total amount required for a complete treatment cycle, the dispensing capacity of individual dosing means being calculated in accordance with the nature of said medicinal substance.

70 8. An inhalator according to Claim 7, in which means are provided as a guarantee to be broken upon the first use of said inhalator.

9. An inhalator according to Claim 1, in which said cavity is formed on and opposite to the  
 75 bottom of said chamber and has labyrinth apertures communicating with the outside, helical blade-shaped means being interposed between said cavity and said nozzle.

10. An inhalator substantially as described  
 80 herein with reference to and as illustrated in the accompanying drawings.

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